

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Expanding Flexible Use in Mid-Band Spectrum)	GN Docket No. 17-183
Between 3.7 and 24 GHz)	
)	

REPLY COMMENTS OF FEDERATED WIRELESS, INC.

I. INTRODUCTION AND SUMMARY

Federated Wireless, Inc. (“Federated Wireless”), an innovator in the field of new spectrum management tools, such as the Spectrum Access System (“SAS”) that will soon manage dense shared use in the Citizens Broadband Radio Service (“CBRS”), hereby replies to the comments filed in response to the Notice of Inquiry (“NOI”) issued by the Federal Communications Commission (“Commission”) in the above-captioned proceeding.¹ Federated Wireless is pleased with the significant record support for two principles it advanced in its initial comments: (1) spectrum sharing regimes, including those enabled by a SAS, are the most expeditious, efficient, and effective way to promote flexible use of the mid-band spectrum between 3.7 and 24 GHz, and particularly the 3.7-4.2 GHz band; and (2) legacy approaches to spectrum management and transitions are ill-suited to the task at hand and will needlessly restrict utilization of this critically important spectrum.

II. A BROAD CROSS-SECTION OF COMMENTERS AGREE WITH FEDERATED WIRELESS THAT SHARED USE, ENABLED BY DYNAMIC SPECTRUM SHARING TECHNOLOGIES, IS THE BEST AND FASTEST PATH TO ENABLING FLEXIBLE USE OF THE MID-BAND SPECTRUM.

Many commenters joined Federated Wireless in pointing out the benefits of SAS technologies and shared spectrum regimes for the mid-band spectrum at issue in this proceeding. In particular, Cisco Systems, Inc. (“Cisco”), Motorola Solutions, Inc. (“Motorola”), Qualcomm

¹ See *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183, Notice of Inquiry, FCC 17-104 (2017) (“NOI”).

Incorporated (“Qualcomm”), Charter Communications, Inc., Frontier Communications Corporation, Windstream Services, LLC, Consolidated Communications, Inc., NCTA – The Internet & Television Association (“NCTA”), AT&T Services, Inc. (“AT&T”), Verizon, Microsoft Corporation (“Microsoft”), the IEEE Dynamic Spectrum Access Networks Standards Committee, Vivint Wireless, Inc. (“Vivint”), the Dynamic Spectrum Alliance (“DSA”), the Wireless Innovation Forum, and Google LLC and Alphabet Access each highlighted the value spectrum sharing regimes and technology could bring, making flexible use of the 3.7-4.2 GHz band possible while continuing to protect incumbent operations.² Federated Wireless agrees with these commenters that SAS technologies and sharing regimes can aid the Commission in its pursuit of “comprehensive, sound, and flexible spectrum policies, enabling innovations and investment to keep pace with technological advances, and maintaining U.S. leadership in deployment of next-generation services in the long term.”³

Commenters agreed that SAS technology brings many advantages and benefits, creating a new paradigm for spectrum management. Federated Wireless agrees with Cisco that “licensed, unlicensed, and lightly licensed spectrum are all going to be needed to address users’ demand in the 5G future” and that, as a result, “spectrum sharing must be the ‘new normal’ for FCC wireless policy.”⁴ NCTA emphasized that “spectrum sharing technologies are rapidly improving and

² See Comments of Cisco Systems, Inc., GN Docket No. 17-183, at 3 (filed Oct. 2, 2017) (“Cisco Comments”); Comments of Motorola Solutions, Inc., GN Docket No. 17-183, at 1-4 (filed Oct. 2, 2017) (“Motorola Comments”); Comments of Qualcomm Incorporated, GN Docket No. 17-183, at 12-14 (filed Oct. 2, 2017) (“Qualcomm Comments”); Comments of Charter Communications, Inc., GN Docket No. 17-183, at 4 (filed Oct. 2, 2017); Comments of Frontier Communications Corporation, Windstream Services, LLC, and Consolidated Communications, Inc., GN Docket No. 17-183, at 2, 10 (filed Oct. 2, 2017); Comments of NCTA, GN Docket No. 17-183, at 1, 8 (filed Oct. 2, 2017) (“NCTA Comments”); Comments of Microsoft Corporation, GN Docket No. 17-183, at 3-5 (filed Oct. 2, 2017) (“Microsoft Comments”); Comments of IEEE DySPAN, GN Docket No. 17-183, at 6-7; Comments of Vivint Wireless, Inc., GN Docket No. 17-183, at 2-4 (filed Oct. 2, 2017) (“Vivint Comments”); Comments of Dynamic Spectrum Alliance, GN Docket No. 17-183, at 1-5, 9-10 (filed Oct. 2, 2017) (“DSA Comments”); Comments of Google LLC and Alphabet Access, GN Docket No. 17-183, at 9-12 (filed Oct. 2, 2017); Comments of Wireless Innovation Forum, GN Docket No. 17-183, at 2-3 (filed Oct. 2, 2017).

³ NOI at ¶ 1.

⁴ Cisco Comments at 3.

arrangements that would have been unthinkable a decade ago . . . are now close to implementation.”⁵ AT&T noted that “there is the potential for some dynamic sharing of the Lower C-Band spectrum, given the coordinated nature of the earth stations in the bands,” while Verizon observed that “given the concentration of earth stations in urban and suburban areas, the sharing model should probably be considered in conjunction with the relocation, transition, or repacking approaches.”⁶ As the Dynamic Spectrum Alliance stated, “the demand for wireless services is so great that the last generation of spectrum policy tools will never be able to provide consumers and innovators with the resources they need to support economic growth.”⁷

Additionally, commenters observed the dense utilization of spectrum enabled by dynamic sharing technologies. As Motorola suggested, “a multi-tier spectrum sharing approach would best suit a wide range of applications, ensuring the highest spectrum utilization.”⁸ Federated agrees with Microsoft that a sharing framework has the potential to “increase spectrum utilization across the band and, more importantly, benefit the public by making more spectrum available for broadband connectivity and broadband capacity.”⁹

Moreover, commenters acknowledged the flexibility of a SAS-based sharing approach. Motorola highlighted that “the SAS approach offers the most flexibility in adapting to regulatory and protection changes that may occur in the future.”¹⁰ Acknowledging the incumbent protection provided by SAS technology, Vivint noted that “recent technological advances can facilitate spectrum sharing while ensuring that longstanding incumbent services in mid-band frequencies

⁵ NCTA Comments at 1.

⁶ Comments of AT&T Services, Inc., GN Docket No. 17-183, at 9 (filed Oct. 2, 2017); Comments of Verizon, GN Docket No. 17-183, at 19 (filed Oct. 2, 2017).

⁷ DSA Comments at 2.

⁸ Motorola Comments at 1.

⁹ Microsoft Comments at 3.

¹⁰ Motorola Comments at 4.

enjoy comprehensive interference protection.”¹¹ Federated Wireless agrees that “a well-designed SAS can balance and protect the needs of new entrants and incumbents without diminishing the utility of the spectrum.”¹²

Indeed, as Federated Wireless has previously explained, SAS technologies can, in addition to enabling spatial reuse and spectrum sharing among disparate uses: (1) improve speed to market over the timeframes typical of traditional spectrum management approaches; (2) seamlessly protect and transition incumbent uses as new service rules are adopted; (3) allow the Commission to simply set baseline technical rules for a particular spectrum band, thereby providing maximum flexibility for use cases to develop organically and obviating the need for the Commission to guess at future use cases; (4) enforce operational requirements and rapidly implement any Commission modifications to those requirements; and (5) simplify regulatory compliance for device manufacturers and users by dictating power levels, frequencies, and other operational parameters.¹³

The Satellite Industry Association, however, contends that SAS technology “cannot be assumed to effectively prevent interference to the thousands of widely deployed earth stations operating in the 3.7-4.2 GHz band,” because the CBRS spectrum has comparatively fewer extended C-band earth stations requiring protection.¹⁴ As an initial matter, and as Federated Wireless noted in its initial comments, SAS technology has already incorporated the protection criteria needed to enable flexible co-channel terrestrial use of C-band FSS spectrum, as determined by the Commission in the CBRS proceeding. Moreover, the intensiveness and geographic dispersion of FSS incumbent use of the 3.7-4.2 GHz band underscores the importance of leveraging SAS technology to enable shared use in this band while protecting incumbents. SAS technology is the

¹¹ Vivint Comments at 2.

¹² Vivint Comments at 4.

¹³ *See, e.g.*, Comments of Federated Wireless, Inc., GN Docket No. 14-177 et al., at 8-15 (filed Jan. 27, 2016).

¹⁴ Comments of the Satellite Industry Association, GN Docket No. 17-183, at iii, 40-41 (filed Oct. 2, 2017).

only spectrum management tool available to the Commission with the capability of enabling and effectively managing shared use among incumbent users and new entrants in a band as intensively used as the C-band.

In view of the significant evidence about, and broad support in the record for, the benefits of employing sharing regimes, including those enabled by SAS technologies, Federated Wireless urges the Commission to exploit these technologies for the mid-band spectrum and unleash these advantages without delay.

III. CERTAIN COMMENTERS ARGUE IN FAVOR OF TRADITIONAL SPECTRUM MANAGEMENT APPROACHES, BUT TRADITIONAL APPROACHES LEAD TO SIGNIFICANT DELAYS IN SPECTRUM DEPLOYMENT AND DO NOT MAXIMIZE SPECTRUM UTILIZATION.

Dynamic sharing technologies are the future of spectrum management. Nevertheless, some commenters argue that this proceeding should result in the adoption of spectrum management techniques and transition frameworks that replicate the Commission's traditional approaches, rather than seeking to advance spectrum management through the use of tools such as SAS technologies. For example, Nokia and Ericsson urge the Commission to clear the 3.7-4.2 GHz band of incumbent users to make way for mobile broadband services.¹⁵ CTIA supports market-based approaches to reallocate the band, such as an incentive auction and repacking process or negotiated relocation of incumbent users.¹⁶ T-Mobile proposes an auction model under which auction winners would pay for the relocation of incumbent operations comparable facilities, similar to the Commission's approach to the PCS and AWS-1 band.¹⁷ Qualcomm likewise believes that the Commission should

¹⁵ See Comments of Nokia, GN Docket No. 17-183, at 12 (filed Oct. 2, 2017) ("Nokia Comments") ("Nokia urges the Commission to clear the band of satellite [Fixed Earth Stations] to allow 5G systems to thrive in the band."); Comments of Ericsson, GN Docket No. 17-183, at 7 (filed Oct. 2, 2017) ("Ericsson Comments") ("There are a variety of options for clearing the band, and the Commission should consider all of them."); *see also, e.g.*, Comments of CTIA, GN Docket No. 17-183, at 2 (filed Oct. 2, 2017) ("CTIA Comments") ("Market-based solutions can be used to relocate FSS and FS to other bands.").

¹⁶ See CTIA Comments at 6.

¹⁷ See Comments of T-MOBILE USA, Inc., GN Docket No. 17-183, at 15, 18 (filed Oct. 2, 2017) ("T-Mobile Comments").

auction flexible use licenses in the 3.7-4.2 GHz band and encourages the Commission to assess “the benefits of repacking current incumbent licensed users” and “the viability of moving these incumbents to other spectrum or other transmission means.”¹⁸ Ericsson suggests that the Commission could make additional spectrum available in the 3.7-4.2 GHz band by improving spectrum efficiency and by limiting or prohibiting future satellite deployments in the band.¹⁹

As Federated Wireless and others have pointed out, use of these legacy approaches has led to decades-long delays, as starkly illustrated in the case of the 700 MHz and AWS-3 bands, each of which was reallocated using traditional approaches and took 14 and 15 years, respectively, to be brought to market. Federated Wireless agrees with Intelsat License LLC (“Intelsat”) and Intel Corporation (“Intel”), who correctly observe that “forced reallocations of spectrum are often long delayed and inefficient.”²⁰ Intelsat and Intel note that “[t]en spectrum allocations over roughly the last 40 years took between six and 18 years—on average 13 years—to reallocate spectrum, from the time of the initial Commission Order to first deployment.”²¹ CTIA, in urging the Commission to employ market-oriented tools to relocate incumbent users out of the 3.7-4.2 GHz band, argues that “[t]hese time-honored relocation procedures have been successfully used to relocate fixed microwave incumbents out of the PCS, AWS-1, and AWS-3 bands.”²² Yet a CTIA report notes approximate lag times of six years, eight years, and 15 years, respectively, for each of those bands.²³ History

¹⁸ Qualcomm Comments at 5; *see also, e.g.*, Nokia Comments at 12 (“Alternative transmission platforms like fiber could also be encouraged.”); T-Mobile Comments at 14 (“[S]ome FSS operators could migrate to a fiber-optic based deployment.”).

¹⁹ Ericsson Comments at 7.

²⁰ Joint Comments of Intelsat License LLC and Intel Corporation, GN Docket No. 17-183, at 12 (filed Oct. 2, 2017) (“Intelsat and Intel Joint Comments”).

²¹ *Id.* at 12, citing CTIA, *Fostering 21st Century Wireless Connectivity: Key Spectrum & Infrastructure Issues for Policymakers*, at 4 (Jan. 12, 2017); Thomas K. Sawanobori, CTIA, *From Proposal to Deployment: The History of Spectrum Allocation Timelines*, at 2 (2015) (“A review of previous allocation efforts show that it takes, on average, 13 years to reallocate spectrum for wireless use.”) (“Sawanobori Report”).

²² CTIA Comments at 6; *see also* Ericsson Comments at 7 (“Options include an incentive auction or other market-based model in which incumbents agree to surrender spectrum rights for payment from new entrants.”).

²³ Sawanobori Report at 1.

shows that the “time-honored” approaches supported by CTIA and others would unacceptably and unnecessarily delay the Commission’s efforts to make valuable mid-band spectrum available for flexible use. Adoption of a dynamic spectrum sharing regime is a far better and more efficient path to promote flexible use of the 3.7-4.2 GHz band.

In contrast to the comments encouraging the Commission to employ legacy spectrum management approaches in the mid-band spectrum, Intelsat and Intel propose an innovative, market-based framework to enable shared use between incumbent satellite operations and newly authorized, flexible terrestrial use in the 3.7-4.2 GHz band. Under this proposal, incumbent satellite users of the band would be incented via commercial agreements with terrestrial interests to identify geographic areas in which portions of the band could be cleared for terrestrial use.²⁴ This approach would leverage the satellite licensees’ knowledge of their—and their customers’—operational needs and use of the spectrum, as well as their technical expertise, to identify and clear segments of the band in particular geographic areas for co-primary terrestrial sharing of the band at the earliest possible opportunity, which Intelsat and Intel estimate to take place within 1-3 years of an adopting order.²⁵ Federated Wireless agrees with Intelsat and Intel that opening portions of the 3.7-4.2 GHz, both by frequency and by geographic area, is technically and commercially feasible. Indeed, a SAS is the tool best suited to the task of making spectrum available on a case-by-case, location-by-location basis as proposed by Intelsat and Intel. Once segments of the band are identified and made available for terrestrial use, a SAS will be needed to coordinate new uses with protected incumbent operations, which the SAS accomplishes through its closed loop operation, incorporating the operational characteristics of both the incumbent satellite uses and the newly authorized terrestrial operations to ensure maximal spectrum utilization and ongoing incumbent protection. Moreover,

²⁴ See Intelsat and Intel Joint Comments at 2.

²⁵ *Id.* at 3.

the rules-based engine capability of SAS technology provides the flexibility needed to implement and enforce the terms of different sharing arrangements based on the individual requirements of particular deployment scenarios. In fact, SAS technology is already capable of doing just this, as CBRS SAS administrators are required to incorporate and enforce coordination agreements entered into by satellite incumbents and terrestrial operators.²⁶

Leveraging SAS technology to enable the Intelsat and Intel sharing proposal will accelerate the availability of much-needed spectrum, and will support a broad range of potential uses cases, such as carrier offload in dense urban areas, enterprise and other localized deployments, and Internet-of-Things and machine-to-machine communications, in addition to traditional wireless broadband. In light of these varied use cases, a 5G ecosystem will develop and flourish even if the entire 3.7-4.2 GHz band is not available on a nationwide, coast-to-coast basis for traditional carrier deployments, and there is no technical basis to argue that such universal availability is required to support 5G. While the Intelsat and Intel proposal provides a framework to implement its innovative, market-based approach to enabling flexible use in the 3.7-4.2 GHz band, and leaves a number of details to resolution through industry collaboration and negotiation, there do not appear to be any significant technical or commercial roadblocks to implementing this type of regime. Federated Wireless thus urges the Commission to consider the Intelsat and Intel proposal in conjunction with any notice of proposed rulemaking issued in this proceeding.

Should the Commission elect to use legacy approaches such as “clear and auction” for the 3.7-4.2 GHz band, however, Federated Wireless agrees with Qualcomm that “spectrum sharing

²⁶ See 47 C.F.R. § 96.17(e) (“CBSDs may operate within areas that may cause interference to FSS earth stations, in excess of the levels described in §96.17(a) and (b), provided that the licensee of the FSS earth station and the authorized user of the CBSD mutually agree on such operation and the terms of any such agreement are provided to an SAS Administrator that agrees to enforce them. The terms of any such agreement shall be communicated promptly to all other SAS Administrators.”).

mechanisms can protect incumbents while the band is cleared.”²⁷ As Federated Wireless noted in its initial comments, SAS technology is compatible with any licensing regime the Commission might apply to the mid-band spectrum, whether exclusive use, CBRS-like tiered sharing, or unlicensed use.²⁸ The application of SAS technology can be tailored to the characteristics and needs of each particular band. Where the Commission seeks to clear and auction spectrum, SAS technology can enable opportunistic spectrum access in the immediate term as clearing, relocation, and auction processes are developed and executed. As these procedures are developed, SAS technology can be used to manage competing uses of mid-band spectrum, and to minimize interference and protect incumbent operations as needed.

IV. CONCLUSION

Federated Wireless commends the Commission for seeking to ensure continued U.S. leadership in the global race to 5G by promoting flexible use in the mid-band spectrum between 3.7 and 24 GHz. Federated Wireless and a broad cross-section of commenters urge the Commission to leverage spectrum sharing and SAS technology in this pursuit, as doing so is the best and most efficient means to enable flexible use of the mid-band spectrum and will avoid the shortcomings of traditional spectrum management approaches.

Respectfully submitted,

/s/ Ross Vincenti
Ross Vincenti
Chief Legal Officer
Federated Wireless, Inc.
4301 North Fairfax Drive
Suite 310
Arlington, VA 22203

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²⁷ See Qualcomm Comments at 2, 5-6 (providing “options for licensed sharing with incumbents while the FCC carries out means of repacking current incumbent operations and/or clearing the band.”).

²⁸ Comments of Federated Wireless, Inc., GN Docket No. 17-183, at 11-12 (filed Oct. 2, 2017).